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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte THOMAS M. HARTNETT and
JOSEPH M. WAHL

Appeal 2010-003537
Application 09/618,741
Technology Center 1700

Before CHUNG K. PAK, CATHERINE Q. TIMM, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge*
COLAIANNI.

Opinion Dissenting filed by *Administrative Patent Judge*
TIMM.

COLAIANNI, *Administrative Patent Judge.*

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's refusal to allow claims 32 through 67 and 76 through 93. We have jurisdiction pursuant to 35 U.S.C. § 6.

We AFFIRM.

STATEMENT OF THE CASE

The subject matter on appeal is directed to a process for making aluminum oxynitride. Claim 60 is illustrative:

> 60. A process for making aluminum oxynitride comprising:
>
> (a) providing a chamber,
>
> (b) introducing aluminum oxide particles and carbon particles into the chamber,
>
> (c) mixing the aluminum oxide particles and carbon particles while passing nitrogen gas thereover at a temperature sufficient to form the aluminum oxynitride, and
>
> (d) removing said aluminum oxynitride from the chamber.

The Examiner maintains the following rejections:

1) claims 32-67, 76-86, and 88-93 are rejected under 35 U.S.C. § 103(a) as unpatentable over Maguire (US 4,686,070, issued Aug. 11, 1987) in view of Serpek (US 1,030,929, issued Jul. 2, 1912) and optionally in view of Feeco (*Rotary Kilns ~ Thermal Processing*, Nov. 24, 2006, http://www.feeco.com/Products/ThermalProcessing/RotaryKilnInfo/tabid/237/Default.aspx.) and Chemical Engineers' Handbook (ROBERT H. PERRY & CECIL H. CHILTON, CHEMICAL ENGINEERS' HANDBOOK 4-3, 4-4, 4-20, and 4-21 (5th ed. 1984);

2) claim 87 is rejected under 35 U.S.C. § 103(a) as unpatentable over Maguire in view of Serpek and optionally in view of Feeco and Chemical Engineers' Handbook and further in view of Dodds (US 5,925,584, issued Jul. 20, 1999)[1]; and

3) claims 32-67, 76-86, and 88-93 are rejected under 35 U.S.C. § 103(a) as unpatentable over Applicants' Prior Art Admission (AAPA) alone or in view of Serpek and optionally in view of Feeco and Chemical Engineers' Handbook.[2]

With respect to rejections (1) and (3), Appellants argue the claims as a group. (App. Br. 11-18). Accordingly, we address Appellants' arguments regarding the rejections with respect to independent claim 60 only. *See* 37 C.F.R. § 41.37(c)(1)(vii)(2009).

With respect to rejection (2), Appellants provide no additional argument for this rejection. (App. Br. 11-18). Therefore, the claim in rejection (2) stands or falls with our decision regarding claim 60 in rejection (1).

REJECTION (1)

ISSUE

Did the Examiner reversibly err in determining that the combined teachings of Maguire and Serpek would have suggested a process for

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[1] The Examiner has withdrawn the rejection over Maguire in view of Serpek and optionally in view of Feeco and Chemical Engineers' Handbook and further in view of JP 03023269 A (published Jan. 31, 1991). (*See* Ans. 3 and 8 and Final Rejection, p. 4).

[2] Appellants included claims 68-75 in rejections (1) and (3). (App. Br. 3). However, these claims have been canceled. *See* amendment dated Nov. 20, 2008 (entered on Dec. 4, 2008).

making aluminum oxynitride having the step of mixing aluminum oxide and carbon at a temperature sufficient to form aluminum oxynitride as required by claim 60 within the meaning of § 103(a)? We decide this issue in the negative.

PRINCIPLES OF LAW

"[T]he fact that a specific [embodiment] is taught to be preferred is not controlling, since all disclosures of the prior art, including unpreferred embodiments, must be considered." *Merck & Co. v. Biocraft Labs., Inc.*, 874 F.2d 804, 807 (Fed. Cir. 1989).

As stated in *KSR Int'l Co. v. Teleflex Inc.*,

> [A]nalysis [of whether the subject matter of a claim would have been obvious] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

550 U.S. 398, 418 (2007). "A person of ordinary skill is also a person of ordinary creativity, not an automaton." *KSR*, 550 U.S. at 421.

FACTUAL FINDINGS

1. The Specification discloses that a conversion temperature at which aluminum oxynitride is formed in the claimed process may be about 1700°C -1900°C. (Spec. 6, ll. 5-8).
2. Maguire teaches a preference for forming aluminum oxynitride using a two-step process by heating in a reaction chamber aluminum oxide and carbon in the presence of nitrogen at a temperature of about 1550°C in the first step and at a temperature in the range of 1750 to

2140°C in the second step. (Maguire, col. 2, ll. 50-60). Maguire teaches that its aluminum oxide and carbon may be premixed in a crucible prior to heating in a reactor. (Maguire, col. 2, ll. 35-52 and col. 1, ll. 60-67).

3. Maguire claims a method of producing aluminum oxynitride that includes a single step of heating a temperature within the range of 1550 to 2140°C to form aluminum oxynitride (claim 1).
4. Serpek teaches forming "aluminum nitrid[e]" by heating in a rotary furnace a mixture of carbon and alumina in the presence of nitrogen gas. (Serpek 1, ll. 54-55 and 95-110 and 2, ll. 1-14). In this regard, Serpek teaches that its rotary furnace rotates to mix the carbon and alumina mixture during heating in order to evenly heat and provide better contact between the nitrogen gas and the aluminum-carbon mixture. (Serpek, 1, ll. 16, 25, 50-55, 95-100 and 2, ll. 1-15).

ANALYSIS AND CONCLUSION

Appellants argue that the Examiner erred in maintaining the rejection because Maguire teaches forming aluminum oxynitride using a two-step process (i.e., a first step at a first temperature to produce aluminum nitride and a second step at a second higher temperature to produce aluminum oxynitride) while Appellants' invention forms aluminum oxynitride using a one step process. (App. Br. 12 and 16 and Reply Br.[3] 1).

Appellants also argue that the process suggested by the applied prior art references would not have included the step of mixing the ingredients in the presence of nitrogen gas at a sufficient temperature to form aluminum

[3] We refer to the Reply Brief filed on October 16, 2009.

oxynitride as required by the claim. (App. Br. 16). Specifically, Appellants argue that the combined teachings of the applied prior art references would have suggested using Serpek's rotary furnace to produce aluminum nitride and then removing the formed aluminum nitride from the rotary furnace to react it with alumina to produce aluminum oxynitride. *Id.*

The Examiner finds that Maguire teaches a preference for forming aluminum oxynitride using a two-step conversion process by heating in a reaction chamber aluminum oxide and carbon in the presence of nitrogen at a temperature in the range of about 1550°C to 2140°C. (Ans 5; FF 2). In this regard, it can be inferred from Maguire that its two-step conversion process is performed using a single reaction chamber. (Maguire, col. 1, ll. 62-67). The Examiner reasons that Maguire's preference for a two-step process indicates that a non-preferred embodiment includes other than two steps (Ans. 5). Indeed, Maguire's claim 1 as interpreted in light of Maguire's disclosure includes a non-preferred embodiment directed to a method that includes converting a mixture of aluminum oxide and carbon in the presence of nitrogen gas into aluminum oxynitride in a single step (FF 3). Maguire teaches that its aluminum oxide and carbon may be premixed prior to heating. (FF 2). As correctly pointed out by the Examiner (Ans. 5 and 8), Maguire does not teach the mixing step required by claim 60.

As found by the Examiner (Ans. 5), Serpek teaches forming "aluminum nitrid" (aluminum nitride) by heating and mixing carbon and alumina (aluminum oxide) in the presence of nitrogen gas using a rotary furnace in order to evenly heat the carbon and alumina. (FF 3).

Based upon these facts, we agree with the Examiner that it would have been within the skill of one of ordinary skill in the art to substitute

Serpek's rotary furnace for Maguire's reaction chamber in order to mix the aluminum oxide and carbon mixture during heat treatment in the presence of nitrogen so as to provide the carbon and aluminum oxide mixture with even heating and exposure to the nitrogen. *See KSR*, 550 U.S. at 421. ("A person of ordinary skill is also a person of ordinary creativity, not an automaton.").

With respect to Appellants' argument that the combined teachings of the applied prior art references would not have suggested the mixing step required by claim 60, it is well settled that a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art. *Merck,* 874 F.2d at 807. In this case, while Serpek teaches in its preferred embodiment that its rotary furnace may be used to form aluminum nitride, Serpek also broadly teaches heating and mixing carbon and alumina using a rotary furnace in order to provide even heating and exposure to nitrogen. (*See* FF 4). Maguire teaches using a premix of aluminum oxide and carbon in the reaction chamber (FF 2). Accordingly, using Serpek's rotary furnace as Maguire's reaction chamber would have provided the aluminum oxide and carbon mixture with better exposure to the nitrogen gas and more even heating during the conversion to aluminum oxynitride.

Thus, we agree with the Examiner that the combined teachings of the applied prior art references would have suggested a process for making aluminum oxynitride having the disputed claim step for the reason given above.

With respect to Appellants' argument that Maguire teaches forming aluminum oxynitride using a two-step process, we find that this specific embodiment is not controlling since, in reference to our above discussion,

Maguire plainly teaches that its aluminum oxynitride may be formed in a single step process. (FF 3).

Accordingly, we sustain the Examiner's rejection.

REJECTION (3)

ISSUE

Did the Examiner reversibly err in determining that the combined teachings of AAPA and Serpek would have suggested a process for making aluminum oxynitride having the step of mixing aluminum oxide and carbon at a temperature sufficient to form aluminum oxynitride as required by claim 60 within the meaning of § 103(a)? We decide this issue in the negative.

ADDITIONAL PRINCIPLE OF LAW

The term "comprising" is "inclusive or open-ended" and "does not exclude additional unrecited elements or method steps." *Abbott Labs. v. Sandoz, Inc.*, 544 F.3d 1341, 1360 (Fed. Cir. 2008) (internal quotations omitted).

ADDITIONAL FACTUAL FINDING

5. AAPA teaches forming aluminum oxynitride using the following two step process: (1) heating premixed ingredients (i.e., alumina, which is known to be aluminum oxide, and carbon) in the presence of nitrogen gas at a temperature of about 1650 °C - 1750°C to form aluminum nitride; and (2) heating the formed aluminum nitride and alumina at a temperature of about 1750°C-1850°C to form aluminum oxynitride. (Spec. 1). In this regard, Appellants do not dispute the Examiner's

finding that this two-step process occurs in a single chamber. (*Compare* Ans. 8 *with* Briefs in their entirety).

ANALYSIS AND CONCLUSION

Appellants make the same arguments for rejection (3) as they did for rejection (1). (*See* Briefs in their entirety).

AAPA teaches forming aluminum nitride in a chamber by heating premixed ingredients (i.e., alumina and carbon) in the presence of nitrogen gas at a temperature of about 1650 °C - 1750°C (FF 5). AAPA further teaches that aluminum oxynitride forms at a temperature in the range of 1750 to 1850°C (FF 5). It can be inferred from these teachings of AAPA that alumina and carbon can also be converted to an intermediate product, aluminum nitride and a final product, aluminum oxynitride at the same temperature of 1750°C in a single reaction chamber. As correctly pointed out by the Examiner (Ans. 5 and 8), AAPA does not teach the mixing step required by claim 60.

Serpek teaches forming "aluminum nitrid" (sic., aluminum nitride) by heating and mixing carbon and alumina in the presence of nitrogen gas using a rotary furnace in order to evenly heat the carbon and alumina and provide the carbon and alumina with better exposure to the nitrogen gas. (FF 3).

Given that AAPA's teaching regarding the use of a single reactor to form both the intermediate and final products, we agree with the Examiner that it would have been obvious to one of ordinary skill in the art to carry out AAPA's aluminum oxynitride forming process in Serpek's rotary furnace to mix and react alumina and carbon at a temperature of 1750°C to form both the intermediate product, aluminum nitride, and the final product, aluminum

oxynitride, with a reasonable expectation of successfully providing desired even heating and improved distribution of the nitrogen gas. In so doing, we note that the process suggested by AAPA and Serpek is indistinguishable from Appellants' claimed process as interpreted in the light of the Specification[4].

With respect to Appellants' arguments that AAPA teaches forming aluminum oxynitride using a two-step process, this argument is without persuasive merit because Appellants' temperature range for aluminum oxynitride formation overlaps the temperature range implemented in the process of AAPA as indicated *supra*. In other words, the claims, as properly interpreted, include continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature in a single reaction chamber as taught by AAPA. In this regard, we note Appellants' open-ended transitional claim language "comprising" does not exclude the presence of an intermediate product, aluminum nitride. *Abbott Labs.*, 544 F.3d at 1360.

Accordingly, we sustain the Examiner's rejection.

ORDER

The Examiner's decision is affirmed.

[4] Claim 61 depends upon claim 60 and further recites that the temperature sufficient to form aluminum oxynitride is between 1700-1900°C. Claim 61 makes explicit the temperature range that is included in independent claim 60 by the broadest reasonable construction consistent with the Specification.

TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1).

AFFIRMED

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TIMM, *Administrative Patent Judge.*

I respectfully dissent from the decision of my colleagues. As argued by Appellants, Maguire teaches only a two step process. As such Maguire does not teach converting aluminum oxide particles, carbon particles and nitrogen present in the form of nitrogen gas into aluminum oxynitride. In Maguire's two step process, it is aluminum oxide and aluminum nitride that are converted into aluminum oxynitride. Therefore, I would reverse the decision of the Examiner.